

DAWSON, JOHN WILLIAM
Note on the genus...

Canadian
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NOTE on the Genus *NAIADITES*, as occurring in the COAL FORMATION of NOVA SCOTIA. By SIR J. WILLIAM DAWSON, C.M.G., I.L.D., F.R.S., F.G.S. With an APPENDIX by WHEELTON HIND, M.D., B.S., F.R.C.S., F.G.S.

[PLATE XX.]

IN the autumn of 1892 Dr. Wheelton Hind was so kind as to invite me to place in his hands, for study and comparison, specimens of the bivalve shells from the Coal Formation of Nova Scotia, which I had described under the above generic name,¹ and some of which were described by the late Mr. Salter in the Quarterly Journal of this Society, vol. xix. (1863), under his new generic names *Anthracoptera* and *Anthracomya*. Owing to illness I was unable, at the time, to comply with Dr. Hind's request, and thus the Nova Scotian species lost the benefit of a detailed comparison with the British forms in Dr. Hind's excellent paper of May 1893.² I have now sent a collection of specimens to him, and beg to make the following remarks thereon.

These shells occur plentifully in some of the argillaceous shales of the Coal Formation, and occasionally on the surfaces of flaggy sandstones, but the most abundant repositories are the beds which I have named 'calcareo-bituminous shales' and 'bituminous limestones,' beds which, on account of their superior toughness and black colour, often stand out prominently in the coast-sections, and are sometimes almost entirely composed of these shells.³ As none of the properly marine species of the Carboniferous Limestone ever occur in these beds, and as they are closely associated with the coal-seams, I have always been greatly interested in them—in connexion with the various theories of the deposition of coal. I referred to them in this relation in 'Acadian Geology,' 2nd ed. 1868,⁴ in the following terms:—

"All the lamellibranchiate shells, which are so numerous in some of the shales and bituminous limestones of the Joggins that some of the beds may be regarded as composed of them, belong to one generic or family group. They are the so-called *Modiolas*, *Unios*, or *Anodons* of authors. I proposed for them, some years ago, the generic name of *Naiadites*,⁵ and described six species from the Coal Measures of Nova Scotia, stating my belief that they are allied to *Unionidæ*, and that their nearest analogue may be the genus *Bysso-anodonta* of D'Orbigny, found in the river Paraná.

¹ 'Acadian Geology,' Suppl. 1st ed., 1860.

² Quart. Journ. Geol. Soc. vol. xlix. p. 249.

³ See section of the South Joggins, in 'Acadian Geology,' 2nd and later editions.

⁴ Pp. 202, 203.

⁵ 'Acadian Geology,' Suppl. 1st ed.

Mr. Salter, however, to whom I sent specimens, regards these shells as belonging to his new genera *Anthracomya* and *Anthracoptera*, the former being supposed to be allied to *Myadæ*.¹ More recently Gümbel and Geinitz have described similar shells from Thuringia as belonging to the genera *Unio* and *Anodon*, and regard my *Naiadites carbonarius* (*Anthracoptera carbonaria* of Salter) as a *Dreissena*.² In the present uncertainty as to their genuine relations I shall retain the name *Naiadites* for the whole of the species, giving, however, Salter's generic names in brackets."

In correspondence with Mr. Salter at that time, I had pointed out that these shells were probably freshwater, and objected to his name *Anthracomya* as expressing an incorrect view of the affinities of the shells that I had sent to him; assigning the following among other reasons, afterwards published in 1868 in a new edition of 'Acadian Geology' along with descriptions and figures of the principal species, seven in number:—

(1) Under the microscope these shells present an internal lamellar and subnacreous layer, a thin layer of prismatic shell, and an epidermis, all corresponding to similar structures in the Unionidæ.

(2) The ligament was external; there seem to have been no teeth. The shell was closed (or slightly open) posteriorly, and in some species there are indications of a byssal sinus. The general aspect is in some species that of *Unio*, in others that of *Mytilus*. The wrinkling of the epidermis seems to be, for the most part, an effect of pressure.

(3) I know of no instance of the occurrence of these shells in the marine limestones, or associated with species unquestionably marine.

(4) The mode of their occurrence precludes the idea that they were burrowers, and favours the supposition that they were attached by a byssus to sunken or floating timber.³

(5) The attachment of *Spirorbis* to the outer surface of many specimens seems to show that they were free in clear waters.

On these grounds, and being unable from the specimens in my possession to make out evidence of generic distinctness, I continued to use the name *Naiadites* in preference to adopting the newer names suggested by Mr. Salter. Under this name I have described seven species from the Coal Formation of Nova Scotia, and have now sent specimens of these to Dr. Wheeltou Hind for examination and comparison.

I may add that I do not object to the division of the species into two or more genera, for one of which Salter's name *Anthracoptera* should be retained. I doubt, however, whether these can be distinguished by form alone, which in most cases is all that we have

¹ Quart. Journ. Geol. Soc. vol. xix. (1863) p. 80.

² Neues Jahrb. 1864, pp. 646, 651, and Geol. Mag. 1865, p. 204.

³ Dr. Hind informs me that a specimen in the British Museum (Nat. Hist.), at South Kensington, has the byssus preserved. [This specimen consists of a piece of fossil wood, round which numerous individuals of *Anthracoptera* are clustered in several rows, as they would be if attached by a byssus.—W. H.]

to depend upon. The species seem also to have been very variable, and they present very different appearances in different states of compression.

I may also mention that Dr. Wheelton Hind has been led into an error in supposing that *Estheria Dawsoni*, described by Prof. T. Rupert Jones, F.R.S., in the Geol. Mag. for 1870, may be the same with my *Naiadites laevis*. These shells are quite distinct in forms, markings, and structure, and occur at very different positions in the Carboniferous. *N. laevis* has been found only in a flattened state: its epidermis is strong and wrinkled, and the shell shows traces of prismatic structure.

The associates of *Naiadites* in the admirably exposed sections of the Nova Scotian coal-field, at the South Joggins and Sydney, Cape Breton, are various species of minute bivalve crustaceans, Eurypterids, *Anthraxipalæmon*,¹ scales and teeth of ganoid fishes, and *Spirorbis*. The beds also hold much carbonaceous matter and fragments of fossil plants, often with *Spirorbis* attached. In some cases the beds of *Naiadites*-shale form the roofs of small coal-seams. In a few they have been elevated into soils and have been pervaded with *Stigmalaria*-roots, thus resembling underclays. Their whole conditions point to land-locked ponds or lagoons, or to sluggish creeks. From the continuity of the beds these would appear sometimes to have been extensive, and, in addition to the animals already referred to, they were visited by ganoid fishes of large size, of the genus *Rhizodus*, and by small sharks of the genus *Diplodus* (*Oracanthus*). They were also tenanted by the aquatic batrachians of the period.

As the supposition that the shells of *Naiadites* were marine has placed them out of relation with their associates in the Coal Formation of Nova Scotia, it is a source of gratification to me, and an important contribution to the theory of coal, that their true affinities have now been so ably illustrated by Dr. Wheelton Hind.

APPENDIX.

Through the courtesy and kindness of Sir J. William Dawson I have been favoured with a perusal of his 'Note on the Genus *Naiadites*,' and have carefully examined at his request a series of shells from the South Joggins, as well as a series from the collection of the Geological Survey of Canada, forwarded to me for that purpose.

From an examination of these specimens it is easy to understand Sir William's attitude in considering it impossible to discriminate with any certainty between the different genera of shells in the South Joggins coal-field. They were all more or less crushed in the shale, and therefore showed no interiors, and often the proper external characters were masked. I am quite of the opinion now, from the knowledge I have obtained by a long familiarity with nearly perfect forms, that the genus *Naiadites* contains three distinct genera, for one of which the name must be retained. These three genera are the same as those which generally occur in our Coal

¹ *A. Hilliana*, Geol. Mag. 1877, p. 56.

Measures, a fact which was recognized by the late Mr. Salter, who, in a description of Sir William Dawson's shells, *Quart. Journ. Geol. Soc.* vol. xix. (1863), substituted the names of his newly-erected genera *Anthracoptera* and *Anthracomya* for *Naiadites*, notwithstanding the critical objections raised by the author of the name *Naiadites*.

I have been in correspondence with Sir William on the subject, and propose to retain the name *Naiadites* for the form called *Anthracoptera*.

In my paper published in this Journal, vol. xlix. (1893), p. 249, I figured and showed that Salter's *Anthracoptera* had a striated hinge-plate, a character, the absence of which had been considered to separate the genus *Myalina* (De Koninck), and in *Geol. Mag.* 1893, p. 514, I published a note on *Myalina crassa*, pointing out that there were no anatomical features by which the shells known by that name could be separated from Salter's *Anthracoptera*, at the same time noting that the septa within the beaks described by De Koninck were absent. On looking up De Koninck's original description and figures I find in 1842 ('*Descript. des Animaux Fossiles*,' p. 125) the following description:—"À l'intérieur et immédiatement au-dessous de ceux-ci [the umbones], une petite lame septiforme, semblable à celle que l'on observe dans certaines espèces de *Mytilus*." The figure given is too imperfect to show these characters. In his more recent work, '*Faune du Calcaire Carbonifère*,'¹ he describes the genus and says it is "muni d'une cloison intérieure," but the figures, especially figs. 5, 7 and 9, pl. xxix., demonstrate most conclusively that this septum did not exist in them.

Prof. King ('*Permian Fossils*,' pl. xiv. figs. 5, 7 & 12) shows shells from the Permian which appear to possess this myophorial septum, to which he gave the names *Mytilus squamosus* and *M. septifer*, but in the text he suggests their reference to De Koninck's genus.

M'Coy ('*Brit. Palæozoic Foss.*' p. 492) says, in his description of *Myalina*, that there is "a triangular septum in the cavity of each beak, parallel with the plane of the lateral margins, leaving deep slits under the beaks of the east," but he mentions no specimens from the Carboniferous series. When in the Brussels Museum a few months ago I was unable to see any signs of the septa in De Koninck's specimens, and think it probable that many of his forms will have to be placed with *Naiadites*, the name *Myalina* being retained for the septiferous forms from the Permian, and for any which may appear in the Lower Carboniferous series.

[It has been thought advisable, at the suggestion of the Council and with the assent of the author, to incorporate here the following synonymy of *Naiadites*.—ED.]

¹ *Ann. Hist. Nat. Musée roy. de Belgique*, vol. xi. 1885.

SYNONYMY OF *Naiadites*.

1840. *Naidea*, Swainson, for *Unio*-like molluscs.
 1845. *Naidea*, Buckman, 'Geology of Cheltenham,' Rhætic and Stonesfield plants.
 1845. *Naiadites*, Brodie, Fossil Plants (in 'Fossil Insects').
 1850. *Naiadites*, Buckman, adopted in Quart. Journ. Geol. Soc. vol. vi. p. 415.
 1853. Dawson figured several Molluscs from Nova Scotia resembling *Modiola* and *Unio*, Quart. Journ. Geol. Soc. vol. x. (1854) p. 39.
 1854. *Naiadites*, Morris, for *Naidea* and *Naiadites*, in his 'Catalogue of British Fossils.'
 1855. Dawson again figured one of these molluscs as a *Modiola*, 'Acadian Geology,' 1st ed. p. 148.
 1860. Dawson gave a short description of the shells and referred to the above figure, provisionally naming it *Naiadites*. He described also several species; the first and type species being *Naiadites carbonarius*. Supplement to 1st ed. 'Acadian Geology,' p. 43.
 1861. Salter gave the name of *Anthracomya* to certain British Coal-measure molluscs with full descriptions and figures, Mem. Geol. Surv., 'Iron Ores of Great Britain,' pt. iii. p. 229.
 1862. Salter speaks of three species of *Naiadites* he had received from Dr. Dawson, namely *Naiadites elongatus*, *N. carbonarius*, and *N. levis*. The first and last of these he refers to *Anthracomya*, and for the other, *N. carbonarius*, Dawson's type, he proposes the name "*Anthracoptera* for these triangular shells."

If the name of '*Naiadites*' can be retained for any of these molluscs it must be for this type-species *N. carbonarius*, for which Salter erroneously proposed the generic name of *Anthracoptera*, Quart. Journ. Geol. Soc. vol. xix. (1863) p. 80.

- Note.—Wheulton Hind, 1893 (see below), says that the form figured by Salter, Quart. Journ. Geol. Soc. vol. xix. p. 79, fig. 3, as *Anthracoptera carbonaria* is not the same as Dawson's type, 'Acadian Geology,' 1st edit. p. 148, and Quart. Journ. Geol. Soc. vol. x. p. 39.
 1868 & 1878. Dawson gives figures and descriptions of these Nova Scotian shells and partially adopts Salter's names as sub-genera for some of the species, thus: *Naiadites (Anthracoptera) carbonaria*, *Naiadites (Anthracomya) elongata*, *Naiadites (Anthracoptera) levis*; but speaks against Salter's idea of the marine nature of these shells (as quoted above, p. 436), 'Acadian Geology,' 2nd & 3rd edit. p. 202 *et seqq.*
 1893. Wheelton Hind adopts Salter's two genera *Anthracomya* and *Anthracoptera*, for the British species, but says that the specimen from Nova Scotia figured by Salter as *Anthracoptera carbonaria* is not the same as Dawson's *Naiadites carbonarius*; the latter, Hind says, is an *Anthracomya*, Quart. Journ. Geol. Soc. vol. xlix. (1893) p. 249.
 1894. Wheelton Hind in the MS. of the present paper proposed to adopt *Naiadites* for *Anthracomya*, and to retain the name of *Anthracoptera* for the type-species of *Naiadites*. He now acknowledges that Salter's *Anthracoptera carbonaria* is the same as Dawson's *Naiadites carbonarius*. The genus *Naiadites*, therefore, will have to be used and *Anthracoptera* discarded. The British forms referred to the latter genus, in the author's 1893 paper, will now be called *Naiadites*.

I must admit the error of which I am convicted by Sir William Dawson—namely, that I confounded *Naiadites levis* and *Estheria Dawsoni*—the more so as the fault was due to carelessness in comparing the numbers of quoted pages.

I am not able to state that any of the species submitted to me are the same as British forms, therefore the specific names must still remain, though, if at any time in the future more perfect specimens are obtainable, it may be quite possible to do so.

I have a series of specimens from the South Joggins labelled by Sir J. William Dawson *Anthracopectera carbonaria*. They existed in very large numbers in some of the shales of the South Joggins, so much so that the greater part of the mass is composed of debris of this shell, with entomostraca and vegetable remains. I have little or nothing to add to Sir William's original specific description, but would point out that his original figure is very misleading, and that *Naiadites carbonarius*, Dawson, differs much from the figure of *Anthracopectera carbonaria*, Salter (Quart. Journ. Geol. Soc. vol. xix. 1863, p. 79), and it was this difference which led me to suppose that Dawson's original specimen was probably *Anthracomya* (Quart. Journ. Geol. Soc. vol. xlix. 1893, p. 249). The umbones were not shown to be terminal, and were described as "acute in the anterior fourth of the shell," while I thought Salter's figure was that of a specimen of one of his *Anthracopectere*.

I am bound to say that Salter's figure more nearly represents the shells which have been sent to me as *Naiadites carbonarius*. In shape this form approaches somewhat to that of *Naiadites (Anthracopectera) modiolaris*, but the umbones are more raised above the hinge-line, more pointed and not curved anteriorly at the apex.

There is one specimen which reveals a typical interior with finely striated hinge-plate, bevelled at the exterior of its outer edge, with trifid anterior muscular scars, and relatively larger posterior-adductor scar. The posterior end was often sinuated above. The periostracum shows the typical characteristics of the genus. There exists, as with us, an elongated form, probably only a variety of this shell; but it evidently comes from a different bed, the matrix being a hard, fine-grained, micaceous sandstone (Pl. XX. fig. 1). It would seem to have been less gregarious in its habit, if one may judge from the paucity of its remains in the specimens to hand.

It is very difficult to be absolutely sure as to the generic position of the shells figured as *Anthracomya elongata*, as there are no specimens showing the hinge-line, ligament, or muscle-scars, but from the shape they probably belong to this group. There is nothing to add to the original description, but I think that the sentence describing the position of the umbones is misleading. It says, "the beaks obtuse and more anterior," but it is difficult to see what is the meaning of the word *more*.¹ It cannot refer to the shell previously described, which is a *Naiadites (Anthracopectera) carbonarius*, and has its umbones very forward; while, comparatively to the length of the hinge-line, the umbones in *N. elongatus* are sub-central in the specimen figured.

There appear to have been two forms or varieties of this shell, one more elongate and comparatively narrower, the other short and as broad as long.

With regard to *Anthracomya arenacea*, the specimen which Sir J. W. Dawson has sent me is typical of Salter's genus; it is allied to the forms found on the Continent, and known as *Anodonta*

¹ [A clerical error for 'less.'—J. W. D., May 1894.]

Goldfussiana. The original drawing in 'Acadian Geology' does not show the gradually expanding posterior end, and would give the idea that the original was an *Anthracosia*. I think the specimen from the McGill College Collection labelled *Naiadites elongatus* belongs to this species. This specimen is nearly 1 inch long, and shows the typical shape and contour.

Naiadites angulatus (Dawson) I consider to be { *Carbonicola* }¹,
Anthracosia }

a pretty little form of typical shape. In the original drawing the posterior-superior angle is too much prolonged backward.

Anthracomya ovalis is a somewhat larger, more tumid shell than *Naiadites elongatus*, to which it approaches. I think that the shells in a block of Millstone Grit from Riversdale belong to this form; if so, it is interesting to note the presence of the same form in the Upper Coal Measures of the Joggins.

Anthracomya laevis is very similar to a shell which is obtained, only crushed flat, from the Wigan coal-field; the English specimens are, however, larger.

Prof. Amalitzky has fallen into error as to the value of the term *Naiadites*, and in his work on the Anthracosidæ of the Russian Permian, 1892, has erected *Naiadites* into a genus of the new family Anthracosidæ, reserving the term for a set of shells totally different from the majority of those for which the name was invented. I have shown above that originally the genus included

<i>Naiadites carbonarius.</i>	<i>Anthracomya laevis.</i>
" <i>elongatus.</i>	{ <i>Carbonicola</i> } <i>angulata.</i>
<i>Anthracomya arenacea.</i>	{ <i>Anthracosia</i> }
" <i>ovalis.</i>	

I shall take an early opportunity of combating other views on this subject contained in Prof. Amalitzky's work.

EXPLANATION OF PLATE XX.

Coal-Measure shells from the South Joggins. The figures are of the natural size, when not otherwise stated.

Fig. 1. *Naiadites*, sp. Elongate form. (Unfortunately the artist has inverted the figure.)

2. *Naiadites carbonarius* (Dawson).
3. " " showing interior. Muscle-pits.
4. *Anthracomya arenacea* (Dawson).
5. " " probably young.
6. " " probably young.
7. *Anthracomya elongata* (Dawson). ×2.
8. " " " ×2.
9. " " " ×2.
10. " " " ×2.

¹ It is highly probable that the term *Anthracosia*, King, must give way to *Carbonicola*, McCoy, on the ground of priority, although the latter's description of the hinge-plate is erroneous.

Fig. 11. Slab with (a) *Anthracomya elongata*.

(b) *Anthracomya*, sp.?

(c) *Naiadites carbonarius*.

(Collection of the Geol. Survey of Canada.)

12. *Anthracomya levis* (Dawson).

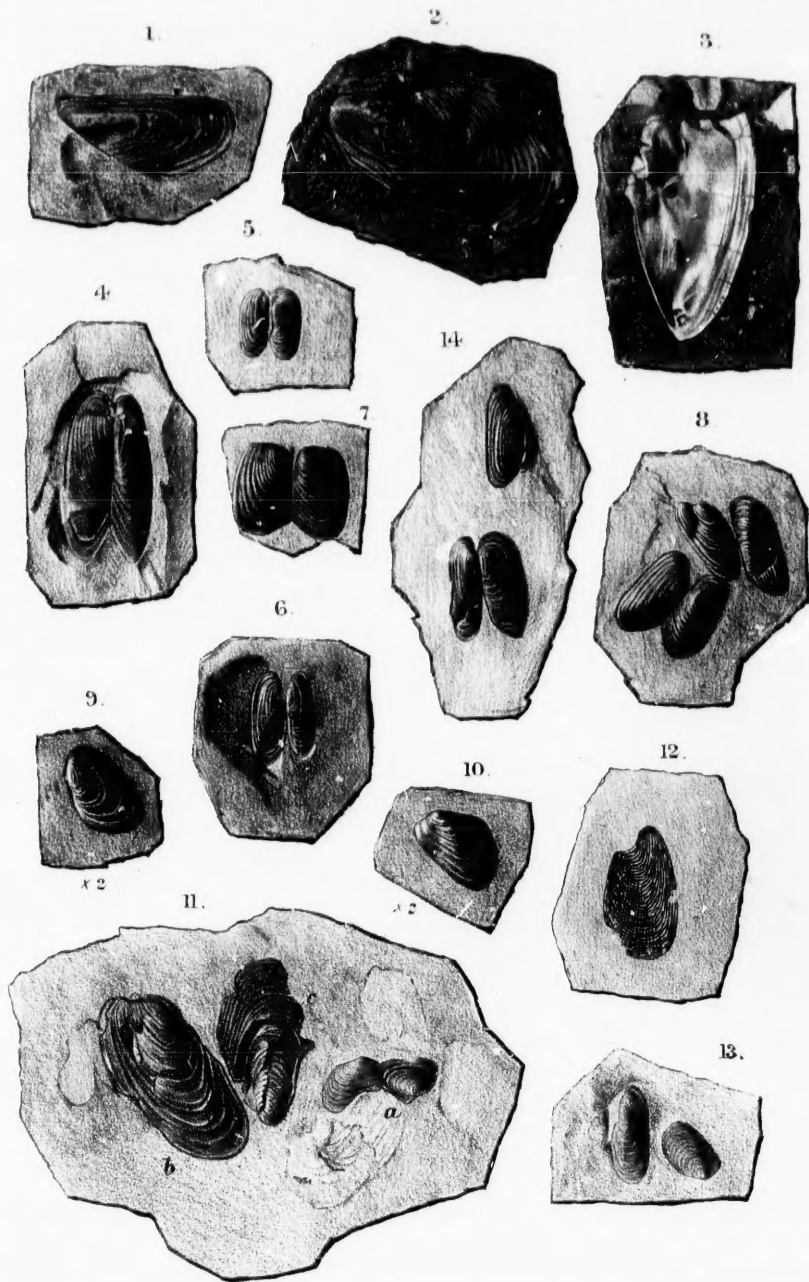
13. *Anthracomya ovalis* (Dawson). Horizon of the Millstone Grit.

14. { *Carbonicola* (M'Coy) } *angulata* (Dawson).
 { *Anthracosia* (King) }

[NOTE.—Specimens 1, 4, 5 belong to Sir J. W. Dawson's collection in the McGill College, Montreal; specimens 11 & 13 to the Geological Survey of Canada. The remainder have been presented to me by Sir J. W. Dawson.—W. H.]

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on in the
Survey of
Dawson.—



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COAL-MEASURE SHELLS FROM THE SOUTH JOGGINS.